

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2005/000112

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. 7: C21B 13/00, C21B 3/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

REFER ELECTRONIC DATA BASE CONSULTED

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI-IPC: C21B 13/ic, C21B 3/04 and SLAG+, FLUX+, RECOVER+, RECYCL+, REUS+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4274867A (BARDENHEUER et al.) 23 June 1981 Whole document	1, 10, 23
X	AU 70604/81 A (MANNESMANN AKTIENGESELLSCHAFT) 19 November 1981 Whole document	1, 10, 23
X	GB 1556833 A (EERSTE NEDERLANDSE CEMENT INDUSTRIE (ENCI) N.V. 28 November 1979 Page 2, line 18 to page 4, line 6	1, 2, 3
X	US 6332910 B (EDLINGER) 25 December 2001 Whole document	1, 10, 17, 18
X	US 6438154 B (VALLOMY) 20 August 2002 Col. 2, lines 26 to 65 and col. 6, lines 12 to 17 and example 1	1, 2, 6, 7, 8, 10, 17, 18, 23

☐ Further documents are listed in the continuation of Box C
 ☒ See patent family annex

* Special categories of cited documents:		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
18 March 2005Date of mailing of the international search report
31 MAR 2005Name and mailing address of the ISA/AU
AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606, AUSTRALIA
E-mail address: pct@ipaustralia.gov.au
Facsimile No. (02) 6285 3929Authorized officer
B. PREMARATNE
Telephone No : (02) 6283 2407

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This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
US	4274867	AR	224512	AU	51544/79	CA	1130568
		DE	2847403	JP	55065311	MA	18633
		NZ	190981	PH	15397	PL	219359
		ZA	7903059				
AU	70604/81	DE	3018689	FR	2482626	NZ	197120
		ZA	8103034				
GB	1556833	AT	788677	AU	30055/77	BE	860433
		BR	7707432	CA	1101676	DE	2747957
		ES	463743	FR	2370006	JP	53081415
		LU	78419	NL	7612299	SE	7712440
		ZA	7706607				
US	6332910	AT	154697	AT	803298	AU	89641/98
		BR	9806267	CA	2271489	CN	1239516
		CZ	9901969	EP	0938591	HR	990143
		HU	0000686	ID	21879	NZ	335477
		WO	9914381	ZA	9808201		
US	6438154	EP	1126039	JP	2001323327	US	2001046251
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.							
END OF ANNEX							

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PCT
INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
 (Chapter II of the Patent Cooperation Treaty)
 (PCT Article 36 and Rule 70)

Applicant's or agent's file reference FP21092	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/AU2005/000112	International filing date (day/month/year) 31 January 2005	Priority date (day/month/year) 30 January 2004
International Patent Classification (IPC) or national classification and IPC		
Applicant TECHNOLOGICAL RESOURCES PTY. LIMITED et al		

<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 3 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> (sent to the applicant and to the International Bureau) a total of 2 sheets, as follows:</p> <div style="margin-left: 40px;"> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> </div> <p style="margin-left: 20px;">b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> <p>4. This report contains indications relating to the following items:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 10%;"><input checked="" type="checkbox"/></td> <td style="width: 15%;">Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application	
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<input type="checkbox"/>	Box No. VIII	Certain observations on the international application																							

Date of submission of the demand 29 August 2005	Date of completion of this report
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustrialia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer B. PREMARATNE Telephone No. (02) 6283 2407

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Box No. I Basis of the report

1. With regard to the language, this report is based on:
- ☒ The international application in the language in which it was filed
- ☐ A translation of the international application into _____, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3(a) and 23.1 (b))
- ☐ publication of the international application (under Rule 12.4(a))
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))
2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):
- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-19 as originally filed/furnished
- pages* received by this Authority on _____ with the letter of _____
- pages* received by this Authority on _____ with the letter of _____
- ☒ the claims:
- pages 20-24 as originally filed/furnished
- pages* as amended (together with any statement) under Article 19
- pages* 25, 26 received by this Authority on 30 November 2005 with the letter of 30 November 2005
- pages* received by this Authority on _____ with the letter of _____
- ☒ the drawings:
- pages 1/3-3/3 as originally filed/furnished
- pages* received by this Authority on _____ with the letter of _____
- pages* received by this Authority on _____ with the letter of _____
- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1 - 38	YES
	Claims	NO
Inventive step (IS)	Claims 1 - 38	YES
	Claims	NO
Industrial applicability (IA)	Claims 1 - 38	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

Claims 1-38 meet the criteria set forth in PCT Articles 33(2)-(4) for novelty, inventive step, and industrial applicability, because the prior art before the priority date of the present claims does not disclose or fairly suggest a steelmaking process as disclosed in the present claims. This steel making process has industrial applicability.

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25 AP20 Rec'd PCT/PTO 27 JUL 2006

34. The process defined in any one of claims 31 to 33 wherein the additional slag forming agent includes calcium oxide.

5 35. The process defined in any one of claims 24 to 34 wherein step (b) includes controlling conditions within the direct smelting vessel to smelt the ferrous feed material to iron in the bath and to substantially partition phosphorus to the slag.

10 36. The process defined in any one of claims 24 to 35 wherein step (b) includes controlling conditions within the direct smelting vessel to partition phosphorus to the slag by maintaining the slag in an oxidising condition
15 whereby the partition ratio of phosphorus in the iron to phosphorus in the slag is at least 1:5.

20 37. The process defined in any one of claims 24 to 36 wherein step (b) includes controlling conditions within the direct smelting vessel to partition phosphorus to the slag by maintaining the slag temperature to be in the range of 1350 - 1450°C and the amount of FeO in the slag to be at least 3% by weight.

25 38. A steel making process that includes the steps of:

(a) producing molten steel and molten
30 steelmaking slag in a steelmaking process in a steelmaking vessel, the steelmaking slag including iron units and flux units; and

(b) producing molten iron in a direct smelting
35 process in a direct smelting vessel containing a molten bath of iron and slag by supplying iron ore or pre-treated iron ore and carbonaceous material to the direct smelting vessel as a part of the feed material requirements of the

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direct smelting process and using a substantial portion of the steelmaking slag from step (a) as another part of the feed material requirements for the direct smelting process and smelting the iron ore or pre-treated iron ore and iron
5 units to produce molten iron.

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